DUXBURY BEACH

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HISTORY OF DUXBURY BEACH

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(For her master of arts in teaching, Sue Amory wrote **A Geological, Ecological and Man-Made History of Duxbury Beach - Past, Present and Future.** The following is a condensed version of her thesis -- Ed.)

Conservation measures for erosion control were stepped up in the Fall of 1967 after the severe storm in May of that year. Greater emphasis was placed on the use of Christmas trees. Nearly 6,000 trees have been delivered over the last 3 years from dealers who did not sell their trees, in addition to those trees donated by Duxbury residents.

After the storm of February, 1972, one of the most destructive Northeasters in years, Poole proposed immediate steps to be taken as conservation measures in an attempt to restore the heavily eroded condition of Duxbury Beach: "The first step is to rebuild all fences with heavy timber, then to close the beach for a few years to give new grass a chance to grow in. Then, instead of using police to check parking stickers, we need them to really keep an eye on the way the beach is used." Frederick Pratt, the head trustee of the Duxbury Beach Association, totally agreed that recreational use was hurting the beach. However, he pointed out that since the barrier beach serves as a right-of-way to the small colony of houses on the Plymouth end of the beach, there was no legal way to keep people off the beach. "You'd need a court order to close the beach. We're building fences down there now, and under the circumstances, that's about all we can do." At the 1972 town meeting, the Duxbury Beach Study Committee was formed to study, in conjunction with the Duxbury Beach Association, alternatives for restoring the beach.

Meanwhile, conservation measures continued on Duxbury Beach. Thanks to the efforts of loyal volunteers, a mile of snow fencing was installed by October 1972. In January, 1973, discarded Christmas trees were again anchored along the fencing by volunteers.

In March of 1973, the town of Duxbury, upon unanimously agreeing that both a vast dune restoration was needed and that the beach should remain in private ownership, appropriated $12,000 to lease Duxbury Beach for one year from its private owners, the Duxbury Beach Association. This lease excluded 3 areas of the beach: 1) the migratory shore bird sanctuary at High Pines, 2) all parking lots, and 3) rights-of-way.

The purpose of the lease article was 1) to provide the trustees of the Duxbury Beach Association with public funds from the rental money to accelerate the restoration work of the pilot program, and 2) to expand the pilot project onto private property of the beach. The town also appropriated $8,000 to employ a part-time beach conservation officer, who would both enforce regulations of the beach and supervise the restoration work on the beach.

The Duxbury Beach Study Committee proposed a 15-month beach restoration program at this time: 1) bulldozing sands from the seaward side at low tide into the eroded sections, so as to raise the level of the beach where it was gullied through by wave action, 2) the continuation of the snow fencing, heavy duty timbers, and Christmas tree program, and 3) a planting and fertilization program of the dunes.

Soon after this program had

been approved by both the Duxbury Beach Association and the town of Duxbury, available sand from the inner, bay side of the beach south of the parking lots was bulldozed into the most eroded blowouts left from recent storms. In addition, a contractor was hired with the rental money to install more snow and heavy timber fencing along the beach.

In April, 1973, 15,000 American beach grass plants were planted by volunteers in one day as a major part of the dune restoration effort. The beach grass was planted in areas that had been stabilized by snow and heavy timber fencing.

In March, 1974, the town of Duxbury renewed the lease for a second year. In April, 1974, an additional 50,000 beach grass plants were planted. The grass heavily multiplied on the dunes with a rainy spring. Roots of the grasses extended 3-4 feet into the dunes, forming thick mats and thus anchoring and holding the dunes together. Also during this year, the installation of snow and heavy timber fencing was extended farther south to High Pines. By August, 1974, signs had been posted along the dune areas to protect the new vegetation. Color coded maps with symbols marking the various rights-of-way, crossover, and conservation areas of the beach were in the process of being made.

At present, there are 5 beach conservation officers for Duxbury Beach. Their responsibility is "educational enforcement;" they have the dual purpose of both controlling and educating the public. In addition, they are ready to work on the beach when the enforcement of beach regulations is not needed.

For over 15 years, Duxbury Beach has been breached by the wind and waves of Northeast storms, as a result of exposed sand dunes left by a loss of vegetation from heavy recreational pressure. Three years ago with the storm of 1972, the beach was at its worst position. Only by the hard-working, dedicated Duxbury residents and outside volunteers has the ravaged condition of the barrier beach been brought back. The dune system is now blanketed by the new beach grass in addition to various other dune community

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plants. As Poole points out, "...beach grass is the key to the whole dune system." Thus, the barrier beach, an extremely fragile resource when subjected to travel by man and machine, has not only been built up in vertical topography, but seems to be successfully regaining its stability with the current dune stabilization program. At present, the answer to the question, "Can Duxbury Beach survive in the metropolitan of Boston?," may be yes.

Future Prospects For Duxbury Beach

Since the successful dune stabilization program began in 1973, there has been no serious storm. Will the present manmade system on Duxbury Beach survive future Northeasters?

Along the Cape Hatteras National Seashore, a region of 150 kilometers of low-lying barrier islands off the coast of North Carolina, artificial stabilization of dunes has proved quite unsuccessful. With over 30 years of artificial dune stabilization, the original geology and ecology of the Hatteras Seashore have been greatly altered. Stabilization by man has brought changes in the beach profile, in dune and marsh morphology, and in plant communities.

The beach berm in stretches of shoreline altered 30 years ago has receded to 30 m or almost disappeared. In most areas, the distance between the barrier dunes and shoreline is 70-100 m in width - a reduction by erosion of 30-40 m from the original distance before stabilization was begun. The Cape Hatteras Lighthouse, built 1,000 m from the beach in the late 1960s, is now less than 100 m from the shoreline. From 1945 to 1969, the beach width was rediced by 9.3 percent, the active sand zone was reduced by 20.1 percent, and the dune area was reduced by 10.7 percent. The latter figure indicates that with artificial stabilization of the dune system, new dune areas are not being formed to replace those being eroded on the ocean side of the barrier islands.

The combination of this beach-narrowing process and the presence of the artificial, permanent dune structure creates a situation where the high energy of waves becomes concentrated in an increasingly limited run-up area. This results in a steeper beach profile, increased stress and turbulence, and a tendency for the beach sand to be broken up into finer material and washed away; the net effect is excessive erosion and thus a further narrowing of the beach berm. In time, the beach may be eroded away above the high water mark. If this occurs, the wave energy is directly applied to the stabilized barrier dune, and a gradual undercutting of the dune front results. This undercutting process eventually results in a destruction of the dune system, threatening man-made structures situated behind the dunes. This is now occurring in several areas along the Hatteras Seashore.

Along the stabilized and fertilized dunes of the Hatteras Seashore, the grasses are excessively dense. Thus, the movement of sand by wind and water is

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arrested close to the beach and does not reach the interior of the islands to build new high ground. Since little sand can be transported past the trapping mechanism of the grasses and over the dune crest, the leeward slope of the dune is steep. In many areas, the diversity in vegetation is relatively low, for other plant species are unable to invade the nearly continuous cover of the beach grass on the dunes. Low plant diversity brings decreased stability to the dune community.

Furthermore, there is succession toward plants not well adapted to the environmental factors operating on the ocean side of a barrier island; the high, stabilized dune system prevents overwash and salt spray and thus enables plants that would otherwise be located much farther from the ocean side to survive on the back slope of the dune. These "out-of-place" plant species, not well adapted to flooding, burial by sand, or salt spray, are killed off when the dunes are breached during a storm.

Thus, over 30 years of costly dune stabilization has transformed the Cape Hatteras National Seashore into a fragile barrier island system. The dune stabilization project has converted wide, rolling beaches, serving as shock absorbers against the ocean waves, into narrow, steep beaches, abruptly ending in a high artificial sand dike. As this system continues to narrow, further overwash, erosion of articifial barrier dunes, and inlet formation is forecasted.

Located in a more protected area of the Eastern Coast, Duxbury Beach is less frequently contested by the powerful natural environmental forces operating on the oceanic barrier islands of the Hatteras Seashore. However, the combination of the new, man-made permanent dune structure of the dune stabilization program and a possible series of Northeasters in the future could develop, to a certain extent, similar geological and ecological consequences on Duxbury Beach. If this were to occur, as from too much dune building along the barrier beach, the existence of the valuable estuarine ecosystem and the private property along its shores would again be threatened.

As a nearer future prospect for Duxbury Beach, a Boston newspaper recently reported, "Seas and howling winds of Nor'easter storms...caused extensive erosion of dunes along Martha's Vineyard's South Beach, but...plantings of sea grass prevented dunes from being completely flattened."

The action of natural forces that created Duxbury Beach over millions of years have recently, in combination with excessive recreational use, been in the process of eroding the barrier beach. Only through loyal dedication of the Duxbury Beach Association, Duxbury Beach Study Committee, Duxbury residents, and outside volunteers has the condition of Duxbury Beach changed from a "slender thread of white sand doomed to wash into the sea" to a stretch of beach rapidly regaining its vegetative cover and stability. At present, the dune stabilization program has proved to be a successful measure for the restoration of Duxbury Beach.

However, these natural forces operating on Duxbury Beach in the past and present will continue in the future. In order to prevent possible drastic geological and ecological alterations in the future from the combination of a permanent man-made dune structure, severe storms, and recreational pressure, it seems of primary importance to continue a careful monitoring of the newly-stabilized dune system of Duxbury Beach. In this way, changes in dune topography brought about by natural and/or man-made forces may be detected. More importantly, the information obtained from a careful monitoring is invaluable for a determination of appropriate future conservation measures in the fight against erosion of Duxbury Beach.

The stabilization of "Duxbury's most important natural resource" is crucial, for "sand dunes are among nature's most effective barriers against the action of waves, tides, and winds."